DECLARATION UNDER 37 CFR 1.131

We, Monica Minden, of 847 Malibu Meadows Dr., Calabasas, California 91302, and Dmitry Starodubov, of 1025 School St., Webster, Massachusetts 01570, do hereby declare that we invented the subject matter of Patent Application No. 09/924,957 at least as early as the date of October 7, 1998, and by acts undertaken wholly in the United States of America, have diligently pursued this invention with the purpose of its reduction to practice. However, the purpose of this Declaration is to show that this invention was conceived prior to the priority date of August 26, 1999, of US Patent No. 6,344,298 to Starodubov et al., and that its conception was coupled with diligent effort toward reduction to practice until reduction to practice occurred or until the filing date of August 7, 2001.

The invention that is the subject of this patent application was captured in the Invention Disclosure, included herewith as Appendix A and signed on October 7, 1998. As noted on sheet 1 of the Invention Disclosure, we declare that we completed the initial conception of the invention on January 23, 1998. The invention disclosure provides support for the subject matter in all of the claims of Patent Application No. 09/924,957.

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dmitry Starodubov

3/18/04

Date

THIS INVENTION DISCLOSURE IS ... E
PURSUANT TO MY / OUR INVENTION A... EMENT
WITH HRL LLC.

HRL

1. TITLE OF INVENTION

SHEET 1 OF

Single Polarization Fiber Laser

2. INVENTOR(S)

NAME	PAYROLL NO.	SOURCE CODE	LOC	BLDG	MS	PHONE	MANAGER
Monica Minden	68271	30-50-20	MA	250	RL65	317-5535	Metin Mangir
Dmitry Starodubov D-STAR Technologies, Inc. 725 33rd Street Manhattan Beach, CA 90266						(213) 740-0046	Jack Feinberg

This is to acknowledge that the above Invention Disclosure has been received by Corporate Patents and Licensing. The disclosure will be reviewed at the next Evaluation Committee Meeting of your organization and you will be promptly informed of the results. If you have any questions please contact the patent attorney listed on the bottom of this form.

This sheet will be returned to the inventor(s) as a confirmation of receipt by Corporate Patents and Licensing.

LOSS OF RIGHTS THROUGH RELEASE TO THE PUBLIC

The right to apply for and obtain a valid patent may be lost as the result of certain activities, such as (1) disclosing the invention outside of the company without an appropriate confidentiality agreement with the receiving party; (2) using the invention publicly; (3) using the invention privately to build or test items that are to be sold publicly; or (4) putting the invention "on sale" by selling or offering for sale an item or product that embodies or uses the invention, or is made or tested by use of the invention. Submitting a proposal with the intent to use the invention in the performance of a resulting contract puts the invention "on sale".

Please inform me immediately of any of these activities or any plans to undertake any of them.

ASSIGNED ATTORNEY: _____ PHONE ( ) _____

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HRL LABORATORIES
PATENT DOCKET NO.
PD# 281003

THIS INVENTION DISC[illegible]HE IS MADE PURSUANT TO MY / OUR IN[illegible]TION AGREEMENT WITH HRL LLC.

HRL

1. TITLE OF INVENTION SHI

Single Polarization Fiber Laser

2. INVENTOR(S)

NAME	PAYROLL NO.	SOURCE CODE			LOC	BLDG	MS	PHONE	MANAGER
Monica Minden	68271	30	50	20	MA	250	RL65	317-5535	Metin Mangir
Dmitry Starodubov D-STAR Technologies, Inc. 725 33rd Street Manhattan Beach, CA 90266								(213) 740-0046	Jack Feinberg

3. PROOF ON CONCEPTION

A. BY WHOM WAS FIRST DESCRIPTION WRITTEN OR DRAWING MADE?	DATE	TIME SPENT	ACCT. CHARGED	LOCATION OF FIRST DESCRIPTION / DRAWI
Monica Minden	1/23/98	1 hour	none (9/80) ~~CD1857FLL~~	Techn Jn. N 9800
B. TO WHOM WAS INVENTION FIRST DISCLOSED?	DATE			
Metin Mangir	1/23/98			

4. REDUCTION TO PRACTICE

A. WAS A DEVICE EMBODYING THE INVENTION CONSTRUCTED AND TESTED OR THE PROCESS PRACTICED?	YES	BY WHOM	DATE STARTED	DATE COMPLETED	TIME SPEN
		Monica Minden and Dmitry Starodubov			

B. ACCOUNT CHARGED — TIME	ACCOUNT CHARGED — MATERIAL	PRESENT LOCATION OF DEVICE

C. PRESENT LOCATION OF DOCUMENTS (DATE SIGNED AND WITNESSED), INCLUDING PHOTOS, DRAWINGS, AND DATA SHEETS SHOWING REDUCTION TO PRACTICE

NOTE: ALL EVIDENCE OF CONCEPTION (FIRST DRAWING AND FIRST WRITTEN DESCRIPTION) AND EVIDENCE OF REDUCTION TO PRACTICE (DEVICE EMBODYING THE INVENTION AND TEST DATA) MUST BE RETAINED.

5. RELATION TO GOVERNMENT CONTRACT

A. DOES THIS INVENTION RELATED TO WORK PERFORMED UNDER A GOVERNMENT CONTRACT?	YES	CONTRACT NUMBER AND TITLE
		Advanced Discriminating Ladar Technology
B. IS INVENTION BEING USED ON A GOVERNMENT CONTRACT?	NO	CONTRACT NUMBER AND TITLE

6. RELATED DOCUMENTS AND DISCLOSURE (BY YOU OR BY ANOTHER). PLEASE ATTACH COPY.

		DATE	IDENTIFY
A. IS THERE A PUBLICATION OR PUBLIC PRESENTATION RELATED TO THE INVENTION?	NO		
B. ARE THERE ANY RELATED INVENTION DISCLOSURES OR PATENT APPLICATIONS?	NO	DATE	IDENTIFY PD NO. ETC.
C. ARE THERE ANY PROPOSALS OR REPORTS OR OTHER DOCUMENTS RELATING TO THIS INVENTION	NO	DATE	IDENTIFY
D. HAS THE INVENTION BEEN USED, DISCUSSED, DEMONSTRATED OR OTHERWISE DISCLOSED OUTSIDE THE COMPANY (SUCH AS TO A VENDOR OR CUSTOMER)?	YES	DATE 1/23/98	TO / FOR WHOM (COMPANY / PERSON) co-inventor and advisor.

7. SALE

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PATENT DOCKET NO.

PD# 98CC3

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THIS INVENTION DISCLOSURE IS [illegible]E
PURSUANT TO MY / OUR INVENTION A [illegible]EMENT
WITH HRL LLC.

RODUCT EMBODYING INVENTION OR MADE BY TION BEEN PROPOSED, SOLD, OR OFFERED FOR	YES NO X	ORDER NO.	ORDER DATE	DELIVERY DATE	DATE OFFERED OR PROPOSED
DUCT EMBODYING INVENTION OR MADE BY TION IN A DELIVERABLE ITEM?	YES NO X	DELIVERY DATE			

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PATENT DOCKET NO.

PD# [illegible]

8. **SUMMARY OF THE INVENTION**

A. GIVE A BRIEF DESCRIPTION OF YOUR INVENTION. PARTICULARLY POINTING OUT WHAT IS BELIEVED TO BE NOVEL (THE "HEART" OF WHAT IS NEW).

This is a method to obtain single polarization output from a fiber laser. The invention is a tightly looped fiber grating reflector that creates a differential loss for the two polarizations in a fiber laser. The tight loop is made possible by the technique of Starodubov et al. that permits fiber gratings to be made without stripping the protective coating from the fiber.

B. EXPLAIN THE PURPOSE AND ADVANTAGES OF YOUR INVENTION. (WHAT WILL THE INVENTION DO BETTER THAN DONE PREVIOUSLY?)

Fiber lasers naturally oscillate in both available polarizations. To date, no manufacturer has made single polarization, single mode, doped fiber for manufacturing fiber lasers. There is currently no suitable way to polarize fiber laser output that does not incur splicing losses between dissimilar fibers or high-risk, labor-intensive fabrication steps. Using polarization maintaining fiber does not solve this problem because it does not have a differential loss between the two polarizations. This invention describes an inexpensive, low-risk way to eliminate one of the polarizations.

C. IDENTIFY THE COMPANY PROGRAM OR PRODUCT LINE TO WHICH THE INVENTION APPLIES, AND THE EXPECTED VALUE TO THE PROGRAM OR PRODUCT LINE. ALSO IDENTIFY POTENTIAL COMMERCIAL APPLICATION OF THIS INVENTION, INCLUDING AUTOMOTIVE APPLICATIONS, IF ANY.

Single polarization laser output is required in a large proportion of laser systems. Components that use polarize light include heterodyne detectors, most modulators, frequency doublers and shifters, and many amplifiers. Thus, the advantage of a polarized fiber laser output extends to every application in which fiber lasers are used; such as laser communications, laser radar for military and automotive applications, active imaging systems .

D. IDENTIFY THE PRIOR ART KNOWN TO YOU WHICH IS IMPROVED UPON OR DISPLACED BY YOUR INVENTION, AND STATE IN DETAIL, IF KNOWN, THE DISADVANTAGES OF THE CLOSEST PRIOR ART.

A number of techniques have been proposed and/or demonstrated for making a fiber laser oscillate in only one polarization.

Single polarization fiber can be spliced in. This is not desirable at present because available single polarization fibers do not match the parameters of the doped fibers used for the laser gain. The internal splice between dissimilar fibers creates undesired loss.

The fiber can be polished to its core, then metallic or waveguided loss introduced. However, these techniques are labor-intensive and expensive to produce, and present a high risk of breaking the fiber laser.

One proposal, though never successfully demonstrated, was to use the natural birefringence of a fiber grating by using two fiber segments spliced back together after rotating one segment by 90°. However, this is again difficult and labor-intensive, with a high risk of breakage.

Fiber gratings are naturally birefringent (different phase shift, different wavelength for the different polarizations) In low-cost lasers that are designed to use non-polarization-maintaining fiber and grating reflectors, it is better to have the polarization selector be the same element as the birefringent element so that there is no need for polarization transformation or stabilization between separated intracavity elements. When intracavity polarization transformation is necessary, our experience is that the fiber laser becomes undesirably temperature- and motion- sensitive, requiring active control to make the laser output stable. This effect is avoided in the present invention.

SIGNATURE INVENTOR 10-7-98 DATE

READ AND UNDERSTOOD BY: WITNESS: 10-6-98

10-6-98

9. **DETAILED DESCRIPTION**

DESCRIBE YOUR INVENTION IN DETAIL, USING NECESSARY ADDITIONAL SHEETS

This invention describes a simple, inexpensive, nondestructive polarizer for a fiber laser based on a fiber-grating reflector that is tightly curved to accentuate the differential loss between the two polarizations. The enabling technology is the ability to create a fiber Bragg grating without stripping the fiber. This preserves the mechanical strength of the fiber and permits tight loops to be made in the fiber without risk of breaking the fiber. Standard grating fabrication technology requires mechanically stripping the polymer coating of the fiber and then exposing the fiber to intense pulsed ultraviolet light in the 244 nm range. Both of these weaken the fiber. In contrast, the present novel technology exposes the fiber through its polymer jacket using UV light in the 330 nm range. This writing technology uses the photosensitivity window of the fiber core centered at 330 nm, where the standard polymer fiber jacket is transparent. The fiber is not stripped and its mechanical strength is preserved.

An alternate technique to write mechanically strong gratings is to chemically strip the polymer coating, write the grating with cw (not pulsed) UV laser light, and then recoat the fiber.

We used a Nd-doped fiber with ~20 mol.% GeO_2 in the core. The gratings were fabricated using the 334-nm line of a cw A laser. The laser beam was expanded by a cylindrical lens to approximately 1.5 cm. A second cylindrical lens with focal length ~ 3 cm focused the beam onto the fiber core. A phase mask with period ~ 730 nm was placed in front of the fiber tc impress a grating into the fiber core with a Bragg resonance at ~1060 nm. A thin (200-micron) glass slide was placed between the fiber and the phase mask to protect the phase mask surface from possible debris from the polymer coating. Writing powers of 50-200 mW were used. The grating spectra were monitored during writing using a halogen lamp light source and an optical spectrum analyzer. A grating having 10% Bragg intensity reflection could be obtained in 20 seconds to 2 minutes.

A simple fiber laser using this polarizer is shown in Figure 1.

SIGNATURE INVENTOR — DATE 10-6-98

READ AND UNDERSTOOD BY: WITNESS — 10-6-98

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